Communicating Lessons Learned from the AD to the Worker Levels

Two Workers Injured by a Chemical Explosion at TA-9-21

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DX Division &
Corrective Action Team

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Presentation Outline

- ✓ **Primary Lesson Learned.**
- ✓ **Review of the Accident.**
- ✓ **DX-2 Lessons Learned.**
- ✓ **Lessons Learned for Other LANL Operations.**
- ✓ **Corrective Action Roll Down.**

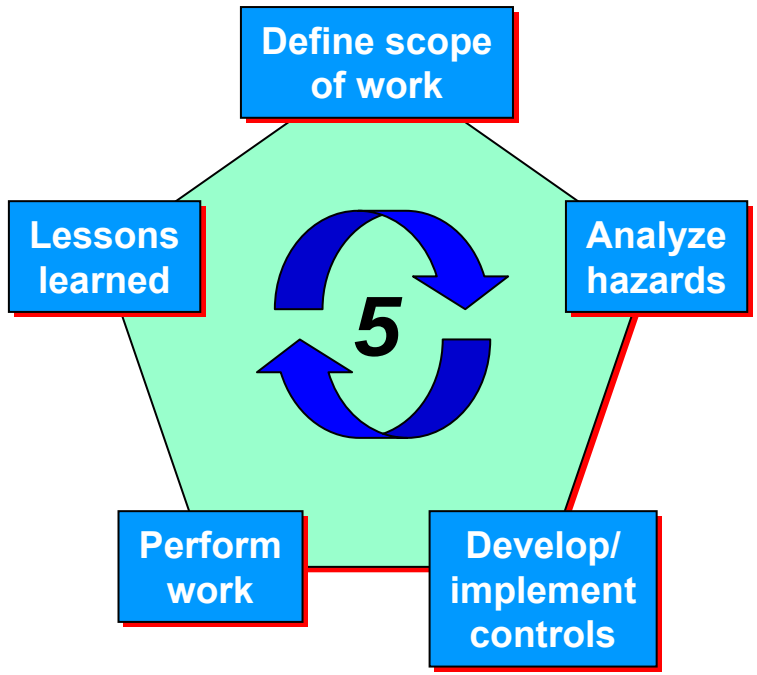
Primary Lesson Learned

DX-2 met IWM standards as defined by the Laboratory.

- **Wrote "quality" Integrated Work Document (IWD).**
- **Sit-down review.**
- **Involved all of the workers including students.**

However, this was still insufficient to protect DX-2 workers.

The IWD is the starting point of the critical safety analysis – not the end.



Accident Background

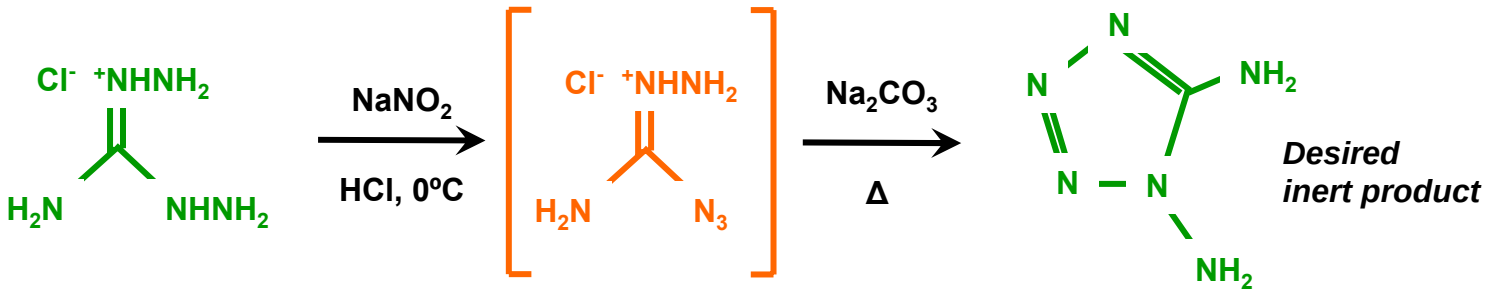
Two workers were performing an organic synthesis of a non-energetic material from a literature preparation.

- **Bad News:** There was an unexpected violent reaction causing glass cuts to both workers.
- **Good News:** Both workers were wearing safety glasses with side shields protecting their eyes from injury.

Expected Synthesis Reaction

Workers trusted literature preparation from peer-reviewed journal article.

- **Although intermediate was energetic, final product was inert.**



- *Inert*
- *Energetic*

Inorg. Chem. **2005**, *44*, 4237–4253

Inorganic Chemistry
Article

Derivatives of 1,5-Diamino-1*H*-tetrazole: A New Family of Energetic Heterocyclic-Based Salts

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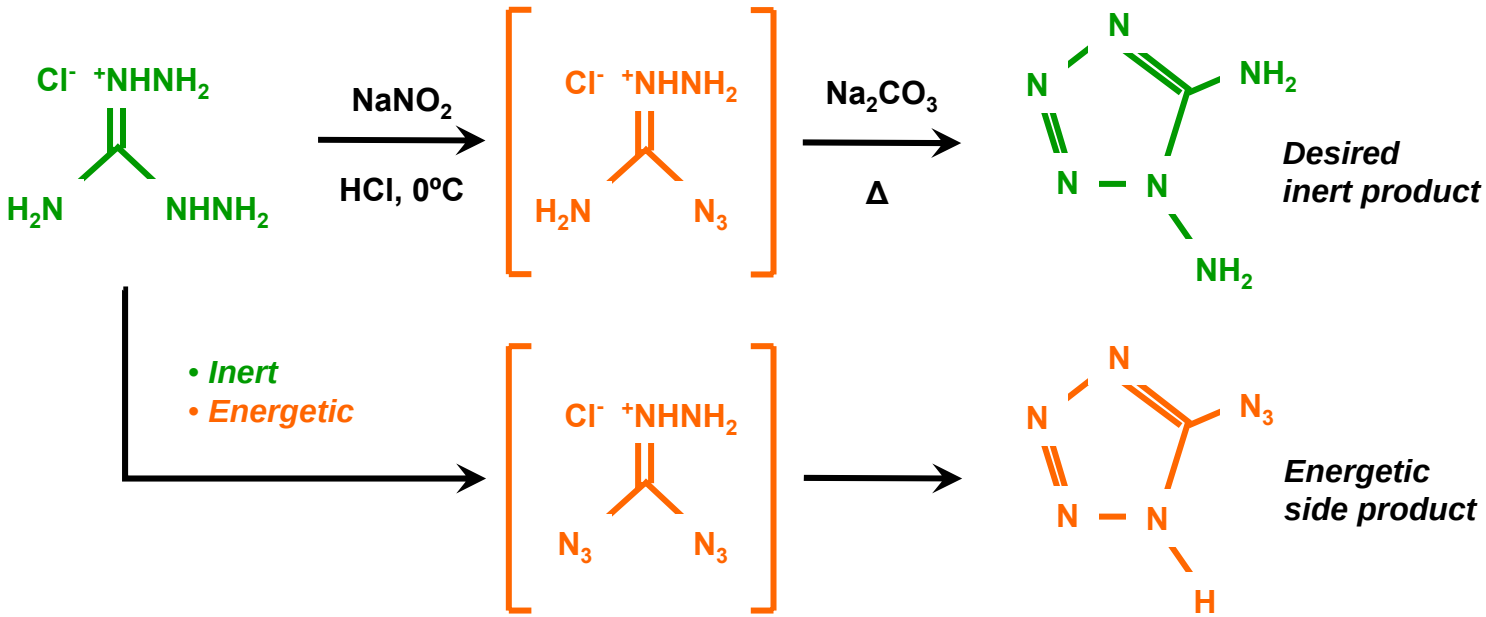
Unexpected Side Reaction

However, literature preparation made no mention of:

- ***Side reaction product and intermediate were highly energetic.***



Mitigations Developed by DX-2 Workers

Following the accident workers implemented peer review with laboratory notebook documentation.

- **Researcher can address specific reaction.**
- **Peer reviewers are knowledgeable of operation.**
- **Peer reviewer performs a critical safety analysis to immediate, specific activity.**
- **Peer reviewer addresses reaction, associated hazards, mitigation, and stop/hold points.**
- **Safety analysis documented in laboratory notebook.**

Certain reactions under general chemistry operations IWD now drive one to more stringent energetic synthesis IWD.

Implemented engineering controls.

Started Advanced Energetic Materials Working Group.

Investigating other safety improvements.

General Lessons Learned from Accident

The IWD is only the starting point of critical safety analysis.

No IWD could possibly assess details of this type of operation – it can only define the scope and safety envelope.

Critical analysis must be continually applied during planning and performing the work at hand.

Could Other Operations at LANL be Similar?

Symptoms that may flag opportunities for safety improvement.

- **Is the IWD perceived as all you need to initiate work?**
- **Is the worker focus on the paperwork?**
- **Is your pre-job briefing primarily centered around the science?**
- **Is your Plan Of The Week just a scheduling exercise?**
- **Are assumptions being made about where the hazards are?**
- **Should there be stop/hold points in the operation?**
- **Are such things as literature preparations, SME, etc. critically assessed for safety?**
- **Are IWDs crafted to optimize the number of activities that they cover?**
- **Are your operations primarily Research and Development?**

Enhancing Critical Safety Analysis

Peer review with notebook documentation is working for DX-2 chemical synthesis operations.

However, critical analysis can be achieved in other ways.

- **Checklists, batch sheets, run sheets may be better suited to particular operations.**
- **Must be graded to the breadth and consequences of error of the IWD.**
- **Worker involvement is essential to improve critical safety analysis.**

Critical analysis enhances safety for your work activities.

- **Engages the workers.**
- **Embedded in the way work is done.**
- **An integral part of daily operations.**
- **Aligned with principles of 5-step process.**

AD Actions for Roll Down/Up

Directorates are to cascade these lessons learned down to the worker level.

- **Emphasize importance of continuous critical analysis.**
- **Discuss need to have adequate specificity in boundary conditions for all IWDs.**
- **Emphasize importance of using 5-step process.**
- **Evaluate how the 5-step process is used within divisions.**
- **Mitigations developed by workers ensure tailoring to their work activities. Because they developed it, they will own it and use it.**

Roll-up actions from divisions.

- ***Directorates will report back actions they will take (with target completion dates).***